



Third year

Acoustics

Sheet (4)

- (1) For the room shown in Fig. (1), the chosen materials are plaster on lath for the front and side walls, a suspended “acoustic” tile ceiling, heavy drapery covering the back wall, and a carpet on a pad on the floor. Calculate the reverberation time using the Sabine equation for low pitched sounds--the 125 Hz and high pitched sounds-- the 2kHz octave bands. Here are the coefficients for room materials for different frequencies. Comment the results.

Material	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
plaster on lath	0.14	0.10	0.06	0.05	0.04	0.03
heavy drapes	0.14	0.35	0.55	0.72	0.70	0.65
carpet on pad	0.08	0.24	0.57	0.69	0.71	0.73
suspended acoustic tile	0.76	0.93	0.83	0.99	0.99	0.99

Table (1)

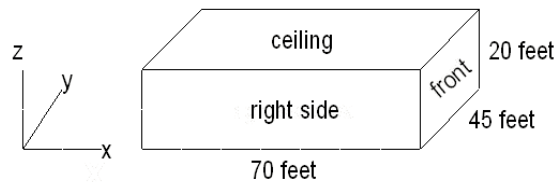


Fig. (1)

- (2) For the classroom shown in Fig. (2), calculate reverberation time at 500 Hz. The absorption coefficients are given in Table (2).

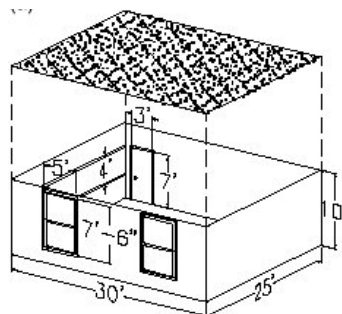


Fig. (2)

	Sound Absorption Coefficient (α)					
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Glass Fiber Ceiling Tile	0.70	0.85	0.75	0.85	0.90	0.90
Fiberglass Wall Panel - 2 inch thick	0.30	0.50	0.80	0.90	0.80	0.75
Concrete Block, painted	0.10	0.05	0.06	0.07	0.09	0.08
Gypsum Wall Board	0.25	0.15	0.08	0.06	0.04	0.04
Plaster Wall or Ceiling	0.14	0.10	0.06	0.05	0.04	0.03
Linoleum or Tile Floor	0.02	0.03	0.03	0.03	0.03	0.02
Thin Carpet, on concrete	0.05	0.10	0.25	0.30	0.35	0.40
Wood Door	0.15	0.11	0.09	0.07	0.06	0.06
Glass	0.35	0.25	0.18	0.12	0.07	0.04
Chalkboard	0.01	0.01	0.01	0.01	0.02	0.02

Table (2)

- (3) Consider a classroom with the following properties:

Dimensions: 5m x 8m x 2.5m.

Materials: laminate flooring, plastered walls and ceiling.

Calculate RT for this classroom at 500 Hz and 1000 Hz, where the absorption coefficients are given in Table (3).

Material	125 Hz	250 Hz	500 Hz	1000 Hz
Plaster board	0.03	0.03	0.02	0.04
Laminate flooring	0.15	0.1	0.1	0.1
Thin carpet	0.1	0.15	0.25	0.3
Thick carpet	0.2	0.25	0.35	0.4
Suspended ceiling	0.1	0.25	0.70	0.85
Wall panel (board)	0.3	0.3	0.35	0.4

Table (3)

If you know that, for mid-frequency (average of 500 Hz, 1 kHz, and 2 kHz) the upper limit recommended for reverberation time is 0.6 sec for primary classroom and 0.4 sec for classroom designed specifically for use by hearing impaired students. Change the classroom materials and give a new design which can meet these requirements.